African-American Students Struggle with High-Stakes Mathematics Testing

Randy Lattimore, Wayne State University <aa3127@wayne.edu>

Randy Lattimore received his Ph.D. in mathematics education from The Ohio State University in 1996 and is assistant professor in the Teacher Education Division at Wayne State University in Detroit, Michigan. His professional interests include high-stakes testing, implementation and evaluation of curriculum reform models, and urban education. He is currently the Director of the Pathways to Certification for Minority Teachers Candidates (PCMTC) at Wayne State University.

High-stakes tests are "those whose results are seen—rightly or wrongly—by students, teachers, administrators, parents, or the general public, as being used to make important decisions that immediately and directly affect" students' futures (Madaus, 1988, p. 87). Despite the much talked about changes in mathematics, dismal high-stakes test scores of minority students in urban districts continue to be one of the most serious problems facing the mathematics education community today.

The Third International Mathematics and Science Study (TIMSS) (US Office of Education, 1996) revealed that US school children consistently lag behind students in other highly technological nations in mathematics and science achievement and that many African-American students scored on the low end of the US schools. Proponents and opponents of high-stakes tests (Fisher, Roach, & Kearns, 1998; Pritchard, 1998; Wilson & Rossman, 1993; Firestone, Goertz, & Natriello, 1997; Wolf, 1998) can argue about this issue because of the huge void in the literature examining the consequences of such testing relative to underrepresented groups. More specifically, even the scant literature that is available does not address the impact of high-stakes tests on African-American high school students. However, all educators and policy makers will agree on one point, that high-stakes tests are now or shortly will be used in a majority of the states (Natriello & Pallas, 1998).

Even the scant literature that is available does not address the impact of high-stakes tests on African-American high school students.

The Council of Chief State School Officers (1998) indicated that 22 states currently have examinations required for high school graduation. An additional 5 states are in the process of developing examinations that will be required for high school graduation. The Education Commission of the States (1997) reports that three states offered endorsed diplomas to students who not only pass an exit test, but score at a level higher than the minimum required for a regular diploma. The same report also noted that three states offer an honors diploma to students who pass a more rigorous test. The results in these reports however are moving targets, because state-level policies regarding graduation tests continue to rapidly shift. This paper has as its focus, a qualitative research study that was conducted to investigate the mathematics preparation experiences of three African-American students involved in a high-stakes test situation.

The Three Students

Below are descriptions of three African-American tenth graders from a large urban high school in Central Ohio - Tia, Art, and Boo. The cliché "good guys finish last" is an example of what was happening to the three students in the study. These "good" students passed the other parts of the test - citizenship, reading, and writing. They also had good mathematics grades. Tia had taken Algebra II and received a B. Art had taken Algebra I and received a B, and Boo had taken Algebra I and received a B. They also followed the "rules of school." As a group they were active in extracurricular activities such as music, theater, and school sports. They also had stated goals for their future. Tia wanted to be an accountant. Art wanted to be a pharmacist, and Boo wanted to be an architectural engineer. They have done everything that school

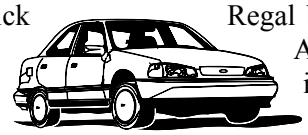
administrators, teachers, and parents have required, but their test performance did not show their hard work.

Introduction to Tia

Tia is a 16 year old African-American female who wishes to become an accountant. Because she likes to work with numbers she needs all the mathematics courses she can take. Tia does her homework as soon as she comes home. Once homework is complete, maybe she has some time to play some games on the computer. Then it is off to work. She enjoys playing the flute, talking on the telephone, going to work, and playing on the computer. She especially enjoys working with numbers, equations, and formulas that help her solve certain mathematics problems. Tia lives with her mother who works as a claim examiner at the state's unemployment office. She was encouraged by her middle school mathematics teacher to take college preparatory mathematics in high school.

Introduction to Art

Art is a 16 year old African-American male who wishes to become a pharmacist. His hobbies are drawing, riding his bicycle, weightlifting, and repairing old cars given to him by his father. The collection so far consists of a 1987 Escort G.T. and a 1986 Buick Regal. He describes himself as not being spoiled, but doing productive things. Art's preference is the 1986 Buick Regal because it feels more luxurious and roomier. He and his sister do not get along. Art admitted that, although the relationship with his sister has been rocky, it has improved in recent years. His sister still considers him her "little brother," a term he hates.



Introduction to Boo

Boo is a 16 year old African-American female. She lives with her mother and four siblings (2 boys, 2 girls) in a fairly decent neighborhood on the south side of a large Midwestern metropolitan city. During our interview, Boo often commented about the closeness of her family and her love for her other siblings. Her hobbies include drawing, singing, dancing, and acting. She is a member of the cheerleading squad, captain on the Army ROTC drill team, and a member of her school's softball team.

As a child, she and her other siblings would gather around their mother, and be fascinated by the stories each told about how their day in elementary school went. At age 12, she participated in a modified version of the Broadway musical "Cats." This is the highlight of her life. Boo believes she is born to be in the spotlight. She said all of her siblings aspire to attend college and major in education, medicine, or law. Boo works as a cashier at a local restaurant in the city.

Resilience to Achieve Despite Barriers

According to these students, the test is taking over their lives. Tia explained:

> I have grown tired of coming to school and taking the test for two hours.

Art echoes the comment:

> I admit the test is important because if I do not pass it, it will hurt me eventually because I want to have "College Preparatory" written on my diploma, and if I do not pass the test, this will not happen.

The closing conversation with Boo went like this:

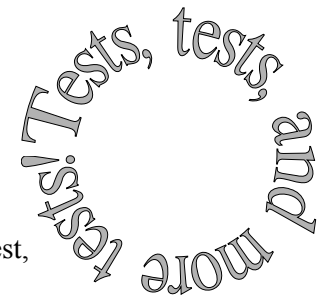
> Randy: How do you feel about not having passed the test so far?
> Boo: I do not like it, but I cannot help it.
> Randy: What keeps you motivated to keep taking the test?
> Boo: I want to pass it so I can go to college.

In fact, the test *is* their life. These realities suggest that perhaps the problem has been that few studies have given voice to African-American students who are in the best place to assess the influences and impact of these tests. By all accounts, the testing process for African-American high school students in high-stakes districts is a complicated one that necessarily has not taken into consideration the context of their culture (Heubert & Hauser, 1998; Natriello & Pallas, 1998; Willingham & Cole, 1997; New York Urban League, Inc. v. New York, 1995). Any programs or solutions developed by educational institutions possibly might be based on models that may not fit the circumstances of the students.

Another theme that also could be detrimental to the preparation process of these students was the indication of last minute preparation as the influence on their perception of the value of the test.

For example, one of the research participants stated:

Art: I had began to study weeks before the test rather than two weeks before the test or the night before the test, relieving the pressure of learning everything at once. I reviewed my math notes for a half-hour a day to help me prepare for the proficiency test.



Another participant stated:

Tia: I admit that last minute cramming led me to be confused about the information I was trying to cram into my head.

Another research participant echoed that response:

Boo: Because you have to cram it all in, and when you get ready to take the test, you have forgotten it all.

In a very passionate discussion with these students, the need to implement alternate strategies or preparation techniques was voiced because of the ineffectiveness of the methods already in place in the school. For example, one participant said:

Art: If you try to cram everything in at the last minute, then you are going to forget something. It is a rush, and it is a rush on your mind.

Two of the participants captured the essence of other students' remarks:

Boo: Because you get all confused in stuff and you need more time to study your work, and more days or a couple of hours then it won't all be crammed in there and you will be ready.

Tia: You cannot study and think over it the way you want to. You are trying to cram it and the information you are cramming in it is not clear.

In sum, these students perceived the test as a barrier.

In sum, these students perceived the test as a barrier. They remained hopeful, although they realized the test was an impediment to them as African-American high school students. It is particularly interesting that according to these students, at a minimum, these imposed pressures tend to create an improvement in their sense of self and instill a committed passion for learning and passing the test.

High-Stakes Testing

Unintended Deleterious Repercussions

Historically, high-stakes testing in the United States has been used to diagnose and classify students and to assign them to educational treatments (Madaus, 1991). Heubert and Hauser (1998) noted, that both proponents and opponents of graduation testing agree that there exists relatively little research that

addresses the consequences of such testing. For example, some Michigan parents in an affluent school district removed their children from high-stakes standardized testing when they perceived that it might be harmful to their children in terms of future college admissions (Johnston, 1997). Unfortunately, relatively few parents in urban districts exercise that option when it comes to their children. Therefore, it is important to evaluate closely the claims and possible ramifications of the detrimental consequences of high-stakes testing on children from diverse backgrounds.

McLaughlin (1991, pp. 250-251) associated the following possible negative fallout of high-stakes testing schemes as:

- discouraging classroom innovation, risk-taking, and invention;
- forcing out of the curriculum the very kinds of learning—higher-order thinking and problem-solving—that some educational theorists and others say are most important to "increase national competitiveness" and success in the world marketplace.

In general, high-stakes testing affected both the content and the sequence of instruction, and efforts to affect test scores directly increased as the testing date approached. Smith and Rottenberg (1991) found that testing reduced the time available for ordinary instruction. Schools were also neglecting material not on the tests, while encouraging the use of instructional methods resembling testing, such as multiple-choice exams. But many high-stakes tests contain many constructed-response tasks, show-all-your-work problems, and explain-your-answer items, including calculations, tables, diagrams, charts, and drawings/graphs.

But why should it take a test to really change the curriculum?

Shepard and Dougherty (1991) found that teachers gave greater emphasis to basic skills instruction and that non-tested content suffered because of the focus on standardized tests. Herman and Golan (1990) also found that teachers spent an inordinate amount of time preparing for tests. Consistent with Shepard and Dougherty (1991), they found that teachers were spending class time on worksheets covering test content and format. Teachers also changed the content and sequence of instruction throughout the year to accommodate the high-stakes test. But why should it take a test to really change the curriculum? Rodgers, Paredes, and Mangino (1991) examined the effects of the Texas Educational Assessment of Minimum Skills (TEAMS) which is a test that students needed to pass in order to graduate from high school. The study of over five years on 12,404 eleventh grade students from the Austin Independent School District focused on language arts and mathematics. Rodgers et al., found that basic skills of the students taking the test, as measured on the Tests of Achievement and Proficiency (TAP), increased as a result of the minimum competency exam, but that higher-order skills remained the same. They concluded that districts should be cautious about narrowing the curriculum and letting higher-order skills suffer for the sake of improving test scores.

Advantages and Disadvantages of High-Stakes Testing

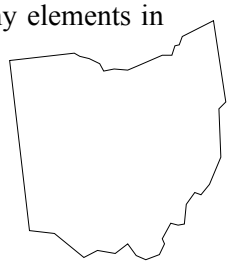
A more complete description of the advantages and disadvantages of high-stakes testing programs shows that some of these effects may at first glance appear to affect the curriculum or the teacher, but ultimately they affect what and how students study and learn and what they come to value in the educational process. Heyneman (1987) noted important advantages and disadvantages that have been attributed (Shepard, 1993) to high-stakes tests:

- They are relatively objective and are an impartial means of distributing educational benefits.
- Preparation for high-stakes tests often overemphasizes rote memorization and cramming by students and drill-and-practice as a teaching method.
- The use of examinations for the dual purpose of certifying the completion of a secondary education and for university admission puts those not bound for college at a disadvantage.

- Results for individual students are often used to serve a variety of purposes for which they may not be designed.

Ohio's High-Stakes Test

A review of the legislative objectives relating to the contemporary statewide testing trend reveals a plethora of hopes and expectations that diverge somewhat across states but have many elements in common. Rather than reduce the list to a set of statistics, examples will be used to convey the character of these objectives. Legislation in the state of Ohio will serve as a point of departure. Ohio's Statewide Proficiency Test went into effect at the beginning of the 1990-91 academic year. By an action of the State Board of Education, all students who entered the ninth grade prior to the 1990-91 school year, even those who dropped out of school and re-entered after September 1990, are bound by the new high school requirements.



The Ohio Proficiency Examination, commonly called the Ninth Grade Proficiency Test is a criterion-referenced test designed to assess minimum competence in reading, writing, mathematics, citizenship, and more recently science skills. In order to receive a high school diploma, students are bound by the policy and must pass all five skill areas of the examination (i.e., reading, writing, mathematics, citizenship, and science), in addition to fulfilling the regular graduation requirements. The test is initially administered during the fall of a student's ninth grade year. Students failing the first attempt are retested in the spring as well as the fall and spring of their tenth, eleventh, and twelfth-grade year until they have passed all parts or are denied a high school diploma. Thus each student receives eight opportunities to pass the test prior to the time of her or his graduation.

Implications for Research in Mathematics Education

My experience with these students convinces me that by creating a space to narrate and re-narrate their stories so as to act on them, we can improve mathematics performance on statewide proficiency tests by developing appropriate and effective teaching strategies. Students are not passive recipients of teacher instruction but are active interpreters of the classroom environment (Weinstein, 1983). Two important frameworks for seeing what is happening in mathematics classrooms are found in the work of Lave and Wenger (1991) and Waldrop (1992). The former gives us an understanding of situated learning, or situated cognition. The latter provides notions of complexity. Together, they might be thought of as "complexity theory" (Casti, 1994; Waldrop, 1992). Situated cognition suggests that individuals do not learn in a vacuum. Rather, learning occurs in multiple social contexts. The mathematics that individuals learn and do can be highly specific.

Thus, success in mathematics for African-American students may need to be deeply embedded in a variety of social contexts.

Thus, success in mathematics for African-American students may need to be deeply embedded in a variety of social contexts (Tate, 1994; Ladson-Billings, 1997). Besides changing the names of story problem characters, teachers will also need to understand the deep structures of students' experiences, and this may mean doing some things with students that have not been done in the traditional mathematics classroom like, interviewing them, having them write autobiographies, discussing their interests in mathematics (Ladson-Billings, 1997).

Teachers provide the experiences that exert powerful influence on students' attitudes about mathematics. However, to learn mathematics, students must want to learn and feel good about learning (NCTM, 2000; Kenney & Silver, 1997; Mullis, Martin, Beaton, Gonzales, Kelly, & Smith, 1997; Beaton, Mullis, Martin, Gonzales, Kelly, & Smith, 1996). What counts is that educators become aware of situations that can cause low engagement and work with students in ways that increase engagement levels by providing mathematics curricula and pedagogy that take full advantage of the "adaptive," "resilient," "complex" nature of learners in urban mathematics classrooms (Ladson-Billings, 1997, p. 706).

Summary

This discussion was not an effort to rationalize the poor performance of African-American students on high-stakes tests. Certainly there exists a plethora of literature that documents the mathematics failure of African-American students. Rather the focus is to address important phenomena for understanding high-stakes testing. The implications of the findings obtained here lead to a consideration for the implementation of the critical elements that determine the success of high-stakes tests in urban settings. Success on these high-stakes tests: Is it appropriate motivation, attitude, and predisposition; or is it what happens to prospective test takers once they actually begin to participate in the test taking process? It is, most likely, some of both. These interviews provide evidence that the assumptions made about these tests can have a powerful influence on the learners' success. What can be seen is that teachers could teach better if they knew their students better. These are only a few of the factors that contribute to successful teaching within the urban classroom.

Unfortunately, two of the individuals in this study were not provided adequate instruction to successfully pass the test (Tia successfully passed on her fourth attempt). These matters cannot be left to the vagaries of chance. Teachers need to consider new methods in their instruction based on the current theories of how individuals acquire knowledge and beliefs about teaching in order to provide the needed assistance to those students who consistently fail high-stakes mathematics tests.

References

Beaton, A. E., Mullis, I. V. S., Martin, M. O., Gonzales, E. G., Kelly, D. L., and Smith, T. L. (1996). *Mathematics achievement in the primary school years: IEA's Third International Mathematics and Science Study (TIMSS)*. Chestnut Hill, MA: Boston College, TIMSS International Study Center.

Casti, J. L. (1994). *Complexification: Explaining a paradoxical world through the science of surprise*. New York: Harper-Collins.

Council of Chief State School Officers. (1998). *Key state education policies on K-12 education*. Washington, DC: Council of Chief State School Officers.

Education Commission of the States. (1997). *States conducting student competency testing for high school graduation (Exit Exam)*. Denver, CO: Education Commission of the States.

Firestone, W., Goertz, M., and Natriello, G. (1997). *From cashbox to classroom*. New York: Teachers College Press.

Fisher, D., Roach, V., and Kearns, J. (1998, March). Statewide assessments systems: Who's in and who's out? [On-line]. Available: http://www.ecs.org/ecs/ecsweb.nsf/f333f38a7982ec63872565c80058b824/.

Herman, J. L., and Golan, S. (1990). *Effects of standardized testing on teachers and learning: Another look*. Los Angeles: Center for Research on Evaluation, Standards, and Student Testing. (ERIC Document Reproduction Service No. ED 341 738)

Heubert, J. P., and Hauser, R. M. (Eds.). (1998). *High Stakes: Testing for tracking, promotion, and graduation*. Washington, DC: National Academy Press.

Heyneman, S. P. (1987). Uses of examinations in developing countries: selection, research, and education sector management. *International Journal of Educational Development* 7: 251-263.

Johnston, R. C. (1997, April). Just saying no. *Education Week*. [On-line]. Available: http://www.edweek.org/ew/1997/28test.h16.

Kenney, P.A., and Silver, E. A. (Eds). (1997). *Results from the sixth mathematics assessment of the National Assessment of Educational Progress*. Reston, VA: National Council of Teachers of Mathematics.

Ladson-Billings, G. (1997). It doesn't add up: African American students mathematics achievement. *Journal for Research in Mathematics Education* 28: 697-708.

Lave, J., and Wenger, E. (1991). *Situated learning: Legitimate peripheral participation*. New York: Cambridge University Press.

Madaus, G. F. (1988). The influence of testing on the curriculum. In L. Tanner (Ed.), *Critical issues in curriculum: 87th yearbook of the NSSE*, Part 1, pp. 83-121. Chicago: University of Chicago Press.
Madaus, G. F. (1991). The effects of important tests on students. *Phi Delta Kappan* 73: 226-231.
McLaughlin, M. W. (1991). Test-based accountability as a reform strategy. *Phi Delta Kappan* 73: 248-251.
Mullis, I. V. S., Martin, M. O., Beaton, A. E., Gonzales, E. G., Kelly, D. L., and Smith, T. L. (1997). *Mathematics achievement in the primary school years: IEA's Third International Mathematics and Science Study (TIMSS)*. Chestnut Hill, MA: Boston College, TIMSS International Study Center.
National Council of Teachers of Mathematics (2000*). Principles and standards for school mathematics*. Reston, VA: Author.
Natriello, G., and Pallas, A. (1998). The development and impact of high stakes testing. [On-line]. Available: http://www.columbia.edu/~gjn6/histake.html.
New York Urban League, Inc. v. New York. 71 F.3d 1031 (2nd Cir. 1995).
Pritchard, I. (1998). Judging standards in standard-based reform. [On-line]. Available: http://www.ecs.org/ecs/ecsweb.nsf/f333f38a7982ec63872565c80058b824/.
Rodgers, N., Paredes, V., and Mangino, E. (1991). *High stakes minimum skills tests: Is their use increasing achievement*? Austin, TX: Office of Research and Evaluation. (ERIC Document Reproduction Service No. ED 336 422)
Shepard, L. A., and Dougherty, K. C. (1991). *Effects of high-stakes testing on instruction*. Paper presented at the Annual Meetings of the American Educational Research Association and the National Council on Measurement in Education. (ERIC Document Reproduction Service No. ED 337 468)
Shepard, L.A. (1993). Evaluating test validity. In L. Darling-Hammond (Ed*.), Review of Research in Education*, 19, pp. 405-450. Washington, DC: American Educational Research Association.
Smith, M. L., and Rottenberg, C. (1991). Unintended consequences of external testing in elementary schools. *Educational Measurement: Issues and Practice* 10: 7-11.
Tate, W. F. (1994). Race, reform, and retrenchment of school mathematics. *Phi Delta Kappan* 75: 477-485.
United States Office of Education. (1996). *Pursuing excellence: Initial findings from the Third International Mathematics and Science Study*. Washington, DC: Office of Educational Research and Improvement.
Waldrop, M. M. (1992). *Complexity: The emerging science at the edge of order and chaos*. New York: Simon & Schuster.
Weinstein, R. S. (1983). Student perception of schooling. *Elementary School Journal* 83: 287-312.
Willingham, W.W., and Cole, N. S. (1997). *Gender bias and fair assessment*. Hillsdale, New Jersey: Erlbaum.
Wilson, B., and Rossman, G. (1993). *Mandating Academic Excellence*. New York: Teachers College Press.
Wolf, R. (1998). National standards: do we need them? *Educational Researcher 27*: 22-25.

QUOTE:
"Aristotle had ruled out any such mathematical approach to physics on the grounds that mathematicians pondered immaterial concepts, while Nature consisted entirely of matter. And Nature, furthermore, could not be expected to follow precise numerical rules." *Galileo's Daughter*, 2000. Page 301, Dava Sobel. Penguin Books. New York.